www.falstad.com/vector3de/

www.its.caltech.edu/~phys1/java/phys1/EField/EField.html

http://phet.colorado.edu/en/simulation/legacy/efield

Electric Fields

Define:

Electric field strength, E, is the force per unit charge on a small positive test charge, q.

$E=F_e/q$

(like g for gravity, $g=F_g/m$)

Electric field lines - show the direction of force on a small positive test charge, q.

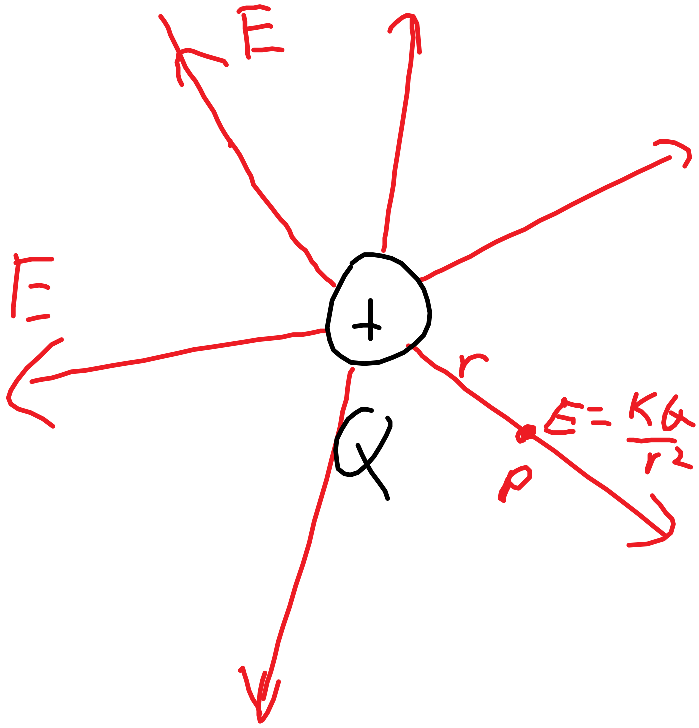
2 types of problems -

1. Around point charges, Q
2. Between charged parallel plates with uniform field, E.

Draw the field lines and give the equation for the electric field for

a) Single positive charge, Q
b) Single negative charge, -Q
c) Two negative charges, -Q1 and -Q2 (equal)
d) A dipole of Q1 and -Q2 (equal maginitudes)
e) A dipole with Q1>|Q2|
f) The field lines around charged parallel plates

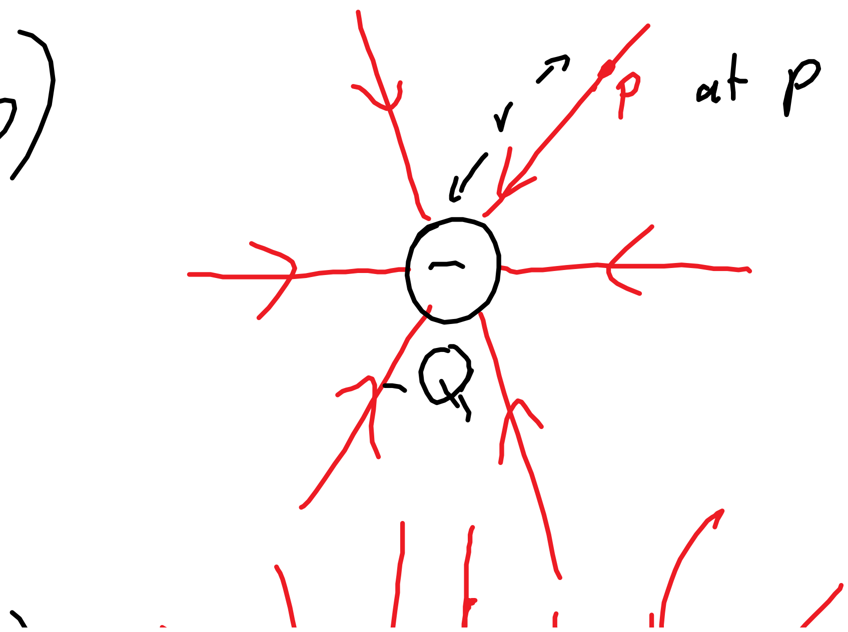
a)



away from positive charge, Q

$$E = \frac{F_e}{q} = \frac{KQ}{r^2}$$

b)



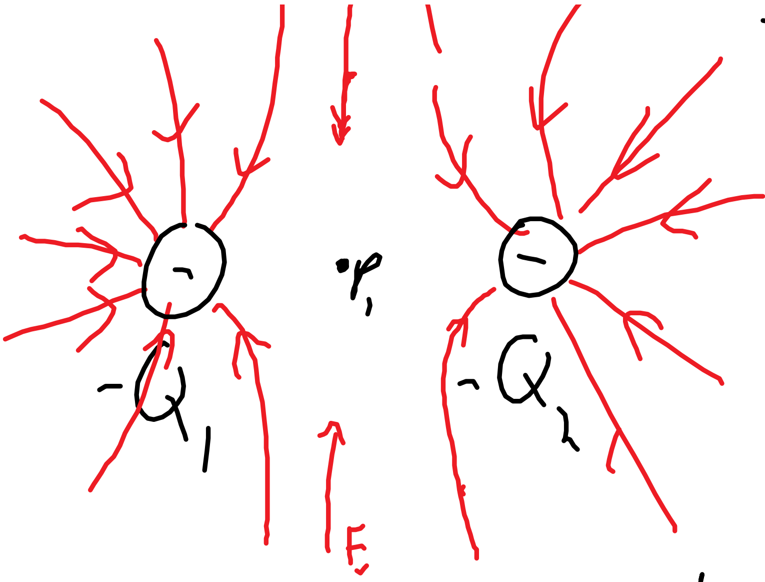
at P $E = \frac{k(-Q)}{r^2}$

E at P_1
$= E_1 - E_2$
$= 0$

$= E_1 - E_2$

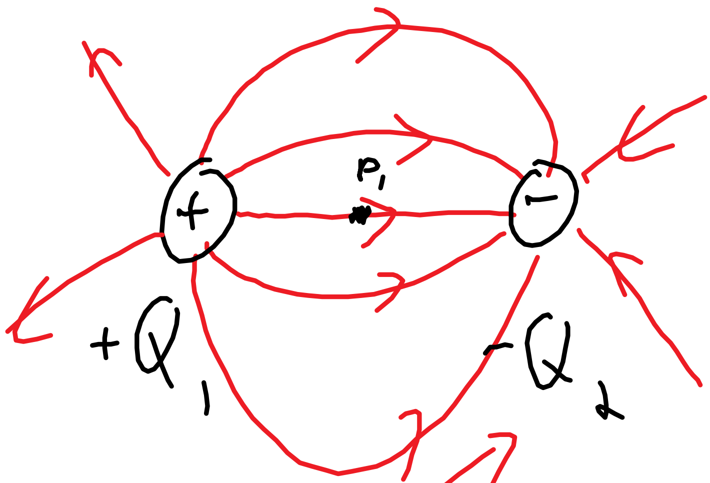
$= 0$

c)



Everywhere E = vector sum of $E_1 + E_2$

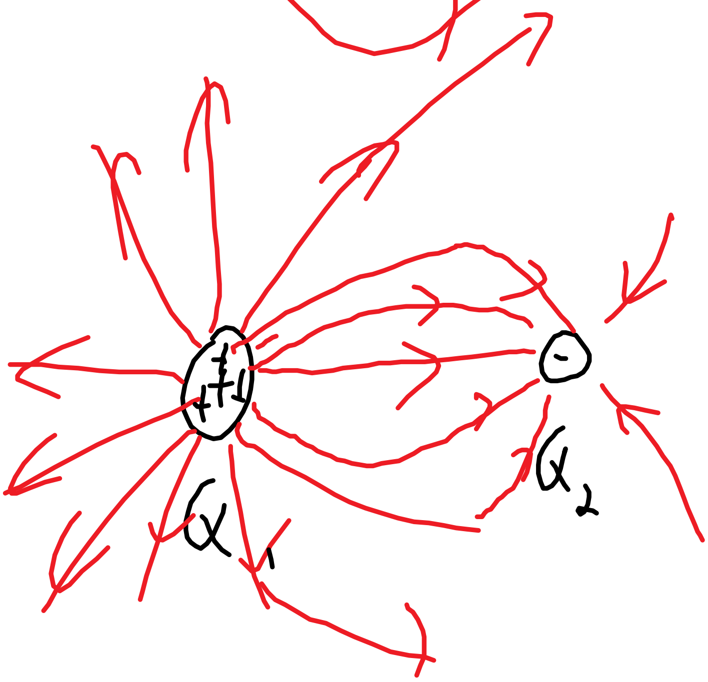
d)



E at P_1

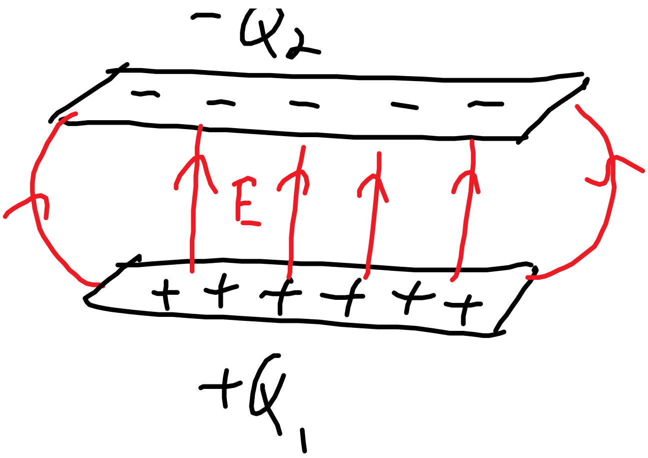
$= E_1 + |E_2|$

e)



f)

f)

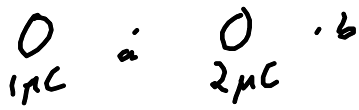


E inside is uniform

* don't use $\frac{kQ}{r^2}$ *

$$E = \frac{F_e}{q}$$

1. A 1.0 μC charge and a 2.0 μC are 0.50 m apart. Determine the electric field strength at



a) Midpoint
b) 0.25 m from the 2.0 μC charge directly away from the other charge
c) 0.25 m above the midpoint (note cosine law/sine law will work)

2. Millikan was able to levitate charged oil drops using charged parallel plates. If the electric field strength between the plates was 4.0 x 10^4 N/C and the oil drop is 2.0 mg, what is the charge on the oil

drop? (Millikan did this thousands of times and determined the charge of the electron)

P438 Q15-25